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Baron, Roper and Baron (1974) claim that group decisions regarding contributions to a charitable cause sometimes represent generally stingier options than the options picked by individuals when choosing alone. Their study and interpretations are consistent with a sizable social psychological literature which postulates that "choice shifts" of various kinds occur as a result of group decision. Theories used to explain "choice shifts" usually rest on principles of group decision involving concepts like cultural values, responsibility, leadership, etc. In the present case, for example, the diffusion of personal responsibility for uncharitable behavior was offered as one explanation for smaller mean donations by groups.

Studies such as the Baron, Roper and Baron paper are attempts to isolate any "major limitations to one of the most basic findings in social psychology: convergence to the average response following group interaction" (p. 539). We argue below that the Baron, Roper

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and Baron results are almost completely explained by a theory which is of substantially different tradition. Furthermore this alternative theory can be used to partially explain that which is of more fundamental concern, circumstances under which one can expect the generally observed convergence phenomenon and when one can expect deviations from it.

1. Competing Theories

Theories found in economics and political science tend to be based upon principles which appear to differ from those used in psychology. One widely accepted theory found in these fields which we apply below to the Baron, Roper and Baron experiments, predicts that groups will, under certain well-defined conditions, reach a majority rule voting equilibrium when such equilibriums exist. A voting equilibrium is a point which can be beaten by no other point in a binary, majority rule contest characterized by sincere voting. For multi-dimensional spaces the mathematical properties of the equilibrium were developed by Plott (1967) and Sloss (1973). The theory for the one-dimensional case was first developed by Black (1958).

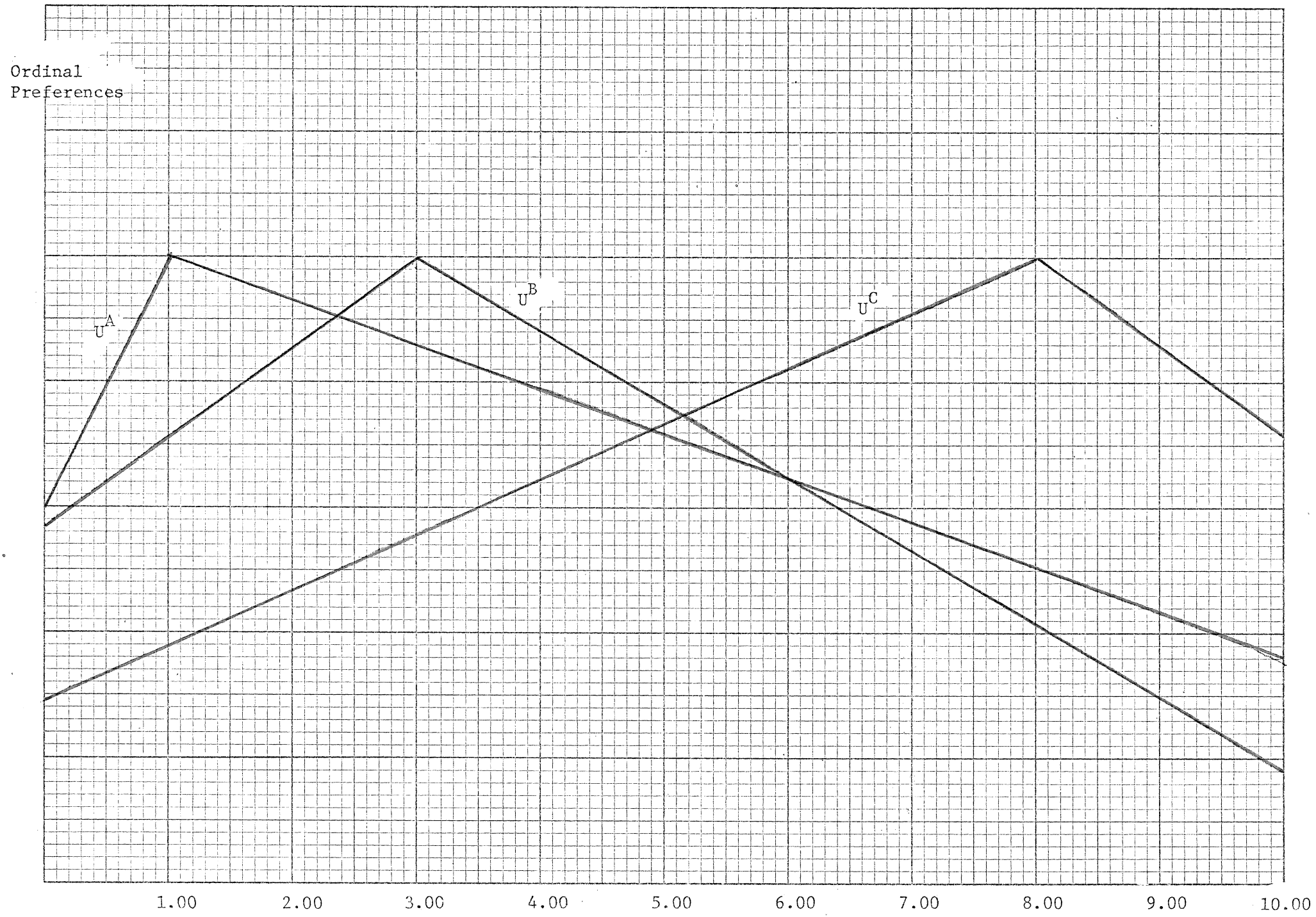
The one-dimensional case seems to apply without modification to the Baron, Roper, and Baron experiment. Suppose on Figure 1 the points A, B, and C represent the amounts that individuals A, B and C are prepared to donate respectively to a charitable cause. These points are, respectively, the "individual responses." Suppose further the individual ordinal preferences for other

donation magnitudes over the domain [0,10] are represented by the utility functions U^A, U^B, U^C, respectively. Notice that both individuals B and C prefer \$3.00 to any amount less and thus would vote for \$3.00 when put against any lesser amount. Individuals A and B prefer \$3.00 to any greater amount, so if \$3.00 is put against anything to its right then both A and B would vote for \$3.00. Thus \$3.00 is the majority rule equilibrium since nothing can beat it (in this case it beats everything else).

When preferences are "single peaked" as shown on the figure and there are an odd number of people, the equilibrium is easy to find. It is the most preferred point of the median individual. More generally in this one-dimensional case, a point is an equilibrium in case one-half or less of the individual's maximums are on either side of the point. If there are an even number of people, many equilibriums may exist. If there are four individuals for example all points on the line segment between the two middle people will be equilibriums.

Notice that according to this model of majority rule processes the group choice has no necessary relationship at all with the mean. On Figure 1 the \$3 equilibrium point is considerably less than the \$4 mean. Now suppose the most preferred point for B was \$6 instead of \$3. In this case the equilibrium would be \$6 which is greater than the mean of \$5. In fact in the three person case if two people have the same preference, the preference of the third, and thus the mean, can take any value while the equilibrium, which is the optimum of the two, remains constant.

Figure 1


Ordinal
Preferences
U^A
U^B
U^C
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00

Under a broad class of conditions, as shown experimentally by Fiorina and Plott (1975) and replicated by Berl, et al. (1976), groups will choose the equilibrium. These conditions are as follows:

i. individual members of the group have strong, stable preferences over the options available to the group;

ii. there is no uncertainty about the consequences or meaning of any group decision;

iii. there are no private deliberations among subsets of group members;

iv. there are no fixed parliamentary procedures (such as an agenda) other than majority rule.

These conditions are thought to represent a set of sufficient conditions for the model to work. Naturally the model may be applicable in a broader class of circumstances as well.

Additional experiments by Plott (1977) have extended the investigation to the case where a unanimity rule is substituted in place of the majority rule. Under unanimity Plott finds that deviations of group choices from the majority rule equilibrium are in the direction of the mean of the individuals' most preferred options.

2. A Comparison of Conditions

The Baron, Roper and Baron (1974) experiments meet almost all of the conditions above where the majority rule equilibrium theory is thought to apply. In their experiments decisions were made about donations to the Iowa Bengali Relief

Committee. Three different items were considered:

(a) a personal pledge,

(b) a university bill assesment for all students (if approved by a student election and providing that individuals could choose not to contribute), and

(c) a student senate contribution.

Subjects were divided into two sets defined here as experiments 1 and 2. For experiment 1 subjects made decisions as individuals on each of the three items before joining a group discussion and decision. For experiment 2 subjects made a group decision on each of the three items first and then afterwards were asked for their decisions as individuals.

A comparison of the conditions under which the majority rule equilibrium model is thought to work with these experimental conditions reveals a reasonable correspondence. Student subjects were asked to read an article about the circumstances of Bengali refugees living in India at the start of the experiment, so subjects were not likely to be indifferent about donations. In the case of individual pledges they were asked to sign pledge cards which were, in turn, to be given to the Bengali Relief Committee so this decision was "real" in that subjects felt that some consequences were to be realized. Decisions regarding the bill assessment and the student senate contribution were hypothetical since nothing was to happen regardless of the subject's decisions. Thus condition (i) may have been satisfied for the individual pledge decision. For the other two items, (b) and (c), the question remains open, but the answer is probably negative.

Condition (ii) is intended to differentiate those cases where groups have a substantial "problem solving" component and rely upon information about decision consequences generated from within the group. These elements seem to be absent in the Baron, Roper and Baron experiments so condition (ii) was probably satisfied. There were no pre-meeting meetings so condition (iii) was satisfied.

Whether or not the final and very important condition was satisfied is open to question. There is some ambiguity about the actual voting rule used by the groups. Subjects were asked to attempt to arrive at a unanimous decision and they were reminded that unanimity is different from majority rule.[1] There was also a three-minute time limit on the length of each deliberation[2] which imposes a parliamentary condition with an unknown effect. Since the instructions did not prohibit the use of majority rule, we suspect that under the circumstances it was frequently substituted for unanimity by those groups which came to a group decision within the time period.

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[1]The instructions read: "...try to arrive at a unanimous decision on each problem. You will recognize that a unanimous decision is different from a majority vote."

[2]In Plott (1977) experimental groups using unanimity and under high payoff conditions deliberated for as long as three hours.

Thus the critical condition (iv), which distinguishes between majority rule and unanimity was not tightly controlled. Consequently one cannot be sure whether the majority rule model prediction or the unanimity model prediction is the appropriate one to apply. In the discussion below we apply them both.

3. Comparative Performance of Models

We argue two points. First, the Baron, Roper and Baron study not only provides new support for the equilibrium theory, it supplies important evidence that the equilibrium model may be applicable to a broader range of circumstances than has been isolated to date. The second conclusion is that the stingy shift reported by Baron, Roper and Baron is a statistical artifact. The assignment of individuals to groups was such that the distribution of the group equilibrium was skewed to the left of the mean. While this second conclusion follows from the first, we established it independently.

In making the comparisons below we have deleted from the Baron, Roper and Baron data all decisions where the group did not reach a single decision on the item (about 24 percent of all decisions). Neither the majority rule equilibrium nor the unanimity model make predictions about groups which reach no decision. Furthermore, one can question the relevance of these cases to the stingy shift hypothesis as well.

3A. Overall Performances

We will view the data from two different perspectives. First, we will compare the overall performance of the two competing models. Secondly, we will examine those special cases where the two models seem to be most directly pitted against each other.

In comparing the overall performance of the two models several factors must be considered. The organization of Table 1 will help isolate them. First, many of the Baron, Roper and Baron groups consisted of four people. These groups frequently had whole sets of equilibria. In order to control for the possibility that any overall accuracy of the equilibrium model might be due to its very broad predictions, we list separately in the table those groups which had a single point equilibrium. Secondly, there are for the groups in experiment 1 sometimes differing measures of individual preferences. In this experiment, individual preference responses were recorded both before and after group decisions. If these two preference measures are sufficiently different the equilibrium will differ according to which measurement is used. In the table the data are evaluated with both sets of measurements as parameters. Thirdly, there is a question about whether the equilibrium prediction should be the equilibrium (as if the rule was majority rule) or the set of points on the "mean preference" side of equilibrium (as if the rule was unanimity). Both predictions are recorded in the table.

A question remains about how one measures the relative accuracy of the models. We have chosen not to use parametric techniques[3] since the basic parameters (individual preferences) vary substantially across groups. Accordingly we interpret the stingy shift model as predicting the set of points strictly less than the mean. A generosity shift theory would predict that the groups would tend to choose some point strictly above the mean. A more generous interpretation of either theory might include the mean with the prediction. The data are avilable for both.

Perhaps the best way to obtain a feeling for the comparative accuracy of the equilibrium based models is from Table 1. On average, across all conditions the majority rule model accounts

[3]There are additional reasons why we chose to use nonparametric tests rather than the analysis of variance used by Baron, Roper and Baron. First, under the hypotheses and data we are using, all individuals are constrained to have the same preference under the "group choice" condition by virtue of coming to a group decision. This linear constraint among individual preference responses is not reflected in the structure of an analysis of variance model. For this observation we are indebted to our colleague, Forrest Nelson. Secondly, the fixed scales used by Baron, Roper and Baron were nonuniform. For example, the allowable responses were $0, $1, $2, $3, $5, $10 for the university bill assessment so a response of $10 could actually represent anything from perhaps as low as $7.50 or less. In the analysis of variance model such "rounding errors" lead to an asymmetric treatment of the groups and individuals that have high responses.

TABLE 1

Experiment No.	Type of Individual Preference Estimate	Type of Decision to Be Made by Group	All Groups											Groups with a Single Point Equilibrium[1]							
			Total No. of Groups Which Reached a Decision	Equilibrium Models				Shift Models						Total No. of Groups Which Reached a Decision	Decisions at an Equilibrium		Decisions Less Than Mean		Decisions at Mean		Decisions Greater Than the Mean	
				Decisions at an Equilibrium		Decisions at an Equilibrium or the Average Side of Equilibrium		Decisions Less Than the Group Mean		Decisions at the Mean		Decisions Greater Than the Mean									
				No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total		No.	% of Total	No.	% of Total	No.	% of Total	No.	% of Total
Experiment One	Pre Group Decision Preference Estimates	Personal Pledge	7	5	71	5	71	5	71	0	0	2	29	4	2	50	2	50	0	0	2	50
		University Bill Assessment	12	9	75	10	83	5	42	1	8	6	50	10	8	80	4	40	1	10	5	50
		Contribution to Be Made by Student Senate	13	9	69	11	85	4	31	2	15	7	54	11(9)	8(6)	73(67)	3	27	2	18	6	55
	Post Group Decision Preference Estimates	Personal Pledge	7	6	86	7	100	4	57	2	29	1	14	5(4)	4(3)	80(75)	2	40	2	40	1	20
		University Bill Assessment	12	10	83	12	100	5	42	2	17	5	42	9(7)	7(5)	78(71)	3	33	2	22	4	44
		Contribution to Be Made by Student Senate	13	11	85	13	100	5	38	6	46	2	15	11(5)	9(3)	82(60)	3	27	6	55	2	18
Experiment Two	Post Group Decision Preference Estimates	Personal Pledge	7	6	86	7	100	4	57	2	29	1	14	6(4)	5(3)	83(75)	3	50	2	33	1	17
		University Bill Assessment	10	7	70	9	90	6	60	2	20	2	20	7(5)	5(3)	71(60)	3	43	2	29	2	29
		Contribution to Be Made by Student Senate	12	12	100	12	100	2	17	7	58	3	25	10(3)	10(3)	100(100)	2	20	7	70	1	10

1. All members of some groups had identical preferences.
The data with these groups deleted are shown inside parentheses.

Source: Table compiled from data sent to us by Baron, Roper and Baron (1974).

for 81 percent of the group choices and the unanimity model accounts for 92 percent. The comparable figures for the stingy shift and generosity shift models are 46 percent and 29 percent respectively. The case for the equilibrium is even stronger if the median, which is perhaps a more reasonable statistic to use here, is used in place of the mean. In the statistics reported below the quantitative differences between the median and mean are so small they can be ignored.

Naturally when using models that do not necessarily make point predictions care must be exercised. For this reason the table contains the data for those groups for which the equilbrium was a unique point. Using these data and again comparing the accuracy of the equilibrium model across conditions we find that on average 77 percent of the groups chose the unique equilibrium point. The comparable figures for the stingy shift and generosity shift models which in these cases still do not make unique point predictions, are 37 percent and 33 percent respectively. This interpretation of course excludes the mean itself from the models' predictions.

The accuracy of the majority rule equilibrium model, when applied to the cases where the equilibrium is unique, can most easily be summarized by two sample Wilcoxon signed-ranked tests with correction for ties (Lehmann, 1975). As shown in table 2 the hypothesis K_1, that the majority rule equilibrium tended to be smaller than the group decision, and the hypothesis K_2, that the majority rule equilibrium tended to be larger than the group decision, were both rejected in favor of the null hypothesis, H_0, that the decision and equilibrium were drawn from the same distribution.

TABLE 2*

Item and Preference Estimate	No. of Cases	K_1 Against H_0		K_2 against H_0	
		V_1	$P(V \leq V_1)$ Under H_0	V_2	$P(V \leq V_2)$ Under H_0
a) Personal Pledge					
i) Pre-meeting preference	4	3	.69	4	.62
ii) Post-meeting preference	11	10	.98	11	.98
b) University Bill Assesment					
i) Pre-meeting preference	10	18	.84	9	.96
ii) Post-meeting preference	16	44	.98	14	.99
c) Student Senate Contribution					
i) Pre-meeting preference	11	21	.85	9	.98
ii) Post-meeting preference	21	20	1.00	21	1.00

*V_i is the Wilcoxon statistic for the data when K_i is taken against H_0; $P(V \leq V_i)$ gives the probability of a value of the Wilcoxon statistic V is less than or equal to the value V_i under the null hypothesis. V has been corrected for the presence of the tied ranks.

There is an additional problem that must be considered. For two items, the university bill assessment and the student senate contribution, a fixed point scale was used: the admissible points were 0, $1, $2, $3, $5, $10, and 0, $100, $200, $500, $1000, $2000 respectively. This limited scale invites the hypothesis that the groups will go to the admissible point nearest to the mean.[4] Unfortunately predictions of this model for the two items overlap most of the time with the predictions of the equilibrium model. Because of the limited number of available points on the scale, only a few separations of predictions exist. The equilibrium does perform better in the few cases of separation and of course, in case of personal pledge no such problem exists. So we are able to reject the hypothesis in favor of the equilibrium.

We can freely conclude that the equilibrium model is a very accurate model of the groups' decisions. However, since the shift based models do have support in the data which is especially true if one adds the means as part of the models' predictions, it is necessary to examine in detail those groups for which the theories come in most direct conflict.

3B. Critical Tests

The arguments above establish a presumption in favor of the equilibrium model but the fact that the models' predictions overlapped so frequently renders the resolution cloudy. In this

[4]Such a model does not always make point predictions, e.g. if the mean is $4 for a group's individual preferences on the university bill assessment item, the model would predict either $3 or $5.

section we examine all of the special decision situations in which models give unambiguously competing predictions.

The first cases are those for which all individuals report identical preferences. When individuals have identical preferences the theories which lie behind the stingy shift model suggest that the group choice will be less than the individuals' unanimous choice. Of course we are still refining the predictions of the stingy shift model to be the set of points strictly less than the group average. The equilibrium model on the other hand predicts the unanimous choice which in this case is also the group average. There were two decisions out of 32 when pre-group decision preferences were used and 20 decisions out of 61 when post-group decision preferences were used, for which all individuals reported the same individual preferences. The group decision was the equilibrium in 100 percent of these cases. Neither a stingy shift nor a generosity shift ever occurred.

The second critical test occurs in the decisions for which the equilibrium was greater than the individuals' average. There were nine cases when pre-group decision preferences are used. The equilibrium was a unique point in all cases and in all nine cases the equilibrium was chosen by the group. There are ten cases to consider when post-group preferences are used and all ten had unique equilibriums. Seven of the ten groups chose the equilibrium.

Our conclusions are unambiguous. Statistical support for the various "shift" theories is an artifact. For the case of individual

pledges, the case on which Baron, Roper and Baron rest their conclusions, the equilibriums happen to be skewed below the mean.

4. Conclusions

The Baron, Roper and Baron results, as we have interpreted them seem to raise some interesting and fundamental questions. First, their experimental results provide important evidence that the equilibrium related models have applicability beyond that which previously has been established. Fiorina and Plott induced subject preferences with monetary payoffs while Baron, Roper and Baron used "natural preferences." Fiorina and Plott also used standard parliamentary procedures for proposing and amending motions while Baron, Roper and Baron evidently allowed the procedures to vary across groups. Thus the Baron, Roper and Baron Experiments establish the applicability of the equilibrium models in much more complicated environment than had been previously examined.

However, the success of the equilibrium model raises questions even within the equilibrium based theories. Why, for example, should the majority rule model work so well when such a great emphasis was placed on unanimity? Perhaps the brief three minutes time limit coupled with low magnitude stimuli play a role. Perhaps groups substitute majority rule in such circumstances. We also noticed that within the groups which did not reach a single decision, there were often subgroups that did. The equilibrium model does a very good job of reflecting the choice of the subgroup when the decisions of the deviate members are excluded from consideration. This uniformity does

not follow (in any obvious way at least) from the reasoning which lies behind the equilibrium models.

The success of the equilibrium model seems to raise some questions about the psychological literature as well. At this point one can call into question all theories about "shifts" in decisions. The equilibrium theories imply that the procedures used by groups impose mathematical laws over group decisions and these resulting laws imply that any "mean tendency" (except perhaps in the case of strictly enforced unanimity) is only a statistical artifact resulting from the initial distribution of preferences. This importance of procedures, especially the agenda, is also demonstrated in the work of Levine and Plott (forthcoming). We did notice, however, that in case of personal pledges and student senate contribution items, the group choice tended to be on the low end of the set of equilibriums when the latter were not unique. Within the equilibriums a "shift" may exist. Perhaps research into the possible merger of the theories is warranted.

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